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Ahmed Helmy
Brendan Jennings
Liam Murphy
Tom Pfeifer (Eds.)

Autonomic Management of Mobile Multimedia Services

9th IFIP/IEEE International Conference on Management
of Multimedia and Mobile Networks and Services, MMNS 2006
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Preface

This volume presents the proceedings of the 9th IFIP/IEEE International Conference on *Management of Multimedia and Mobile Networks and Services (MMNS 2006)*, which was held from October 25th to 27th as part of Manweek 2006 in Dublin, Ireland. In line with its reputation as one of the pre-eminent fora for the discussion and debate of advances in management of multimedia networks and services, the 2006 iteration of MMNS brought together an international audience of researchers and practitioners from both industry and academia.

One of the most significant trends of recent years has been the development and considerable market penetration of multimedia-capable mobile handsets. Nevertheless, significant research challenges remain in the area of management of mobile networks supporting multimedia *services*; challenges which must be addressed by the research community if the vision of ubiquitous availability of advanced multimedia services is to be realised. The MMNS Steering Committee, noting the growing interest within the research community on solving issues relating specifically to the transport of multimedia traffic over various mobile access technologies, made the significant decision to change the long name of the MMNS conference to reflect this change in focus. For 2006 and subsequent years, it will be called “Management of Multimedia *and Mobile Networks and Services*”.

In response to the broadening of the conference scope, the MMNS 2006 Technical Programme Committee issued a call for papers reflecting critical research issues in the area of management of multimedia and mobile networks. These issues included “traditional” MMNS topics such as: distributed multimedia service management, deployment of multimedia services, and protocols for multimedia services; together with new MMNS topics such as: seamless mobility of multimedia services, adaptive multimedia services, and management of wireless ad-hoc networks. Furthermore, the Technical Programme Committee decided that MMNS 2006 should have an overall theme of “Autonomic Management of Mobile Multimedia Services”. This theme was chosen partially to reflect the broader Manweek 2006 theme of “Autonomic Component and System Management”, but also due to the observation that one of the most promising avenues for advances in network and service management research is the application of concepts such as self-governance and self-organisation – concepts that are central to the autonomic management vision.

In response to the call for papers, a total of 71 paper submissions were received from the worldwide research community. Of these, 61 were full papers and 10 were short papers. A comprehensive review process was carried out by the Technical Programme Committee and additional subject area experts, with all papers receiving at least three, and more commonly four, detailed reviews. Subsequently, all submissions were ranked based on review scores as well as the wider Technical Programme Committee’s view of their contribution and relevance to the conference scope. After lengthy discussion, it was decided to accept 18 of the 61 submitted full

papers (29.5% acceptance rate) and 6 short papers (3 of which were initially submitted as full papers, and 3 that were selected from the 10 submitted short papers). These papers present novel and interesting contributions in topics ranging from video streaming to energy consumption models for ad-hoc networks, and from autonomic handover decision management to multimedia caching. We believe that, taken together, they provide a unique insight into the current state of the art in the management of multimedia and mobile networks and services.

There are many people whose hard work and commitment were essential to the success of MMNS 2006. Foremost amongst these are the researchers who submitted papers to the conference. The overall quality of submissions this year was high, and we regret that many high quality papers had to be rejected. We would like to express our gratitude to both the MMNS Steering Committee and the Technical Programme Committee, for their advice and support through all the stages of the conference preparation. We thank all paper reviewers, in particular those outside the Technical Programme Committee, for their uniformly thorough, fair and helpful reviews. We thank both IFIP and IEEE for their continued support and sponsorship of MMNS.

Most of the more time-consuming practical and logistical organisation tasks for the conference were handled by the members of the Manweek Organisation Committee – this made our jobs significantly easier, and for that we are very grateful. Finally, we wish to acknowledge the financial support of both Science Foundation Ireland and the Manweek corporate sponsors, whose contributions were hugely instrumental in helping us run what we hope was a stimulating, rewarding and, most importantly, an enjoy-able conference for all its participants.

October 2006

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Enhanced Multimedia and Real-Time Stream Throughput in Wireless Ad-Hoc LAN Using Distributed Virtual Channel Based MAC*

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Abstract. Recent and upcoming CSMA/CA based MAC protocols for wireless LANs offer block-acknowledgement or aggregated frame exchange in order to provide high data rate for multimedia and real-time data, while all of them avoid collisions by exclusive use of wireless medium that block neighboring nodes of both sender and receiver from participating in concurrent transmission; and thus downgrade medium utilization and overall throughput. In this work, we offer to create concurrent virtual channels over same physical channel by synchronizing the transmit/receive switching of senders and receivers and allow parallel data transfer. Each virtual channel is used by a transmitter/receiver pair and all virtual channels within 2-hop network utilize the medium by distributed coordination and avoid inter virtual channel interference. Simulation result shows that proposed scheme removes the obstruction to participate in parallel transmission for some neighboring nodes of sender and receiver and improves the network performance.

1 Introduction

Multimedia data and real time transmission necessitates increasing demand for reduced average latency at nodes and higher network throughput in wireless LAN environment. Wireless LANs use shared medium that requires an efficient channel access function for successful data transmissions. The choice of medium access scheme is difficult in ad-hoc networks due to the time varying network topology and the lack of centralized control [1]. The access problem when same receiver hears transmissions from many nodes has been much studied since the ALOHA, and it bounds on the throughput of successful collision-free transmissions and forces to formulate efficient transmission protocols [2]. Sharing channels in networks does lead to some new problems associated with hidden and exposed terminals. The protocol MACA [3] and its extension MACAW [4], use a series of handshake signals to resolve these problems to a certain extent. This has been standardized and used in DCF/EDCA/ADCF in IEEE 802.11 family of protocols. Such protocols prohibit all hidden and exposed nodes from participating in concurrent transmission (see fig. 1(a)) and hence packets

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experience latency. Although this scheme supported the wireless LANs for more than a decade, it requires enhancement for increasing demand for higher network throughput (100mbps in 802.11n) for multimedia data. An important approach to improving transfer efficiency is provided with aggregate exchange (AE) sequences for the upcoming IEEE 802.11n that acknowledges multiple MPDUs with a single block acknowledgement (Block ACK) in response to a block acknowledgement request (BAR)[5][6]. This protocol effectively eliminates the contention for every MPDU. If attempting to use the existing MAC protocols without aggregation, a PHY rate of 500 Mbps would be required to achieve the throughput goal of 100 Mbps at the MAC Service Access Point (MAC SAP) [7]. The aggregated exchange (or the block ACK in 802.11e) with conventional RTS/CTS mechanism, however, increases latency for data/multimedia packets at neighboring nodes, because of prolonged delay before channel access.

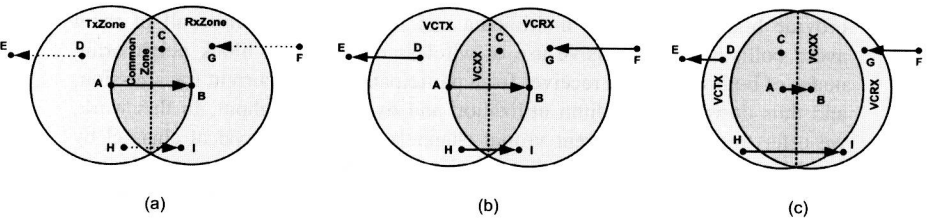


Fig. 1. (a) Conventional Channel reservation where transfer between A and B is possible only; (b) Proposed Virtual Channel Based transfer allowing multiple concurrent transmission; and (c) Virtual Channel scheme when A and B is closer to each other than (b)

In this work, we try to enhance the 802 family of MAC protocols toward distributed spatial reuse of wireless medium for the aggregated exchange or block ACK schemes so that multimedia and real-time data can be transferred in parallel. Our proposed protocol creates separate virtual channel (VC) for every sender-receiver pair and multiple VCs can coexist within same physical channel in 2-hop networks; and, packets can be transferred over these virtual channels concurrently reducing the average latency of the network and increased network throughput.

This rest of this paper is organized as: related works has been described in section 2; section 3 introduces the virtual channel concept and describes how they can coexist without interfering each-other, section 4 describes the mechanism for VC-MAC. Section 5 gives an analytic model for VC delay overheads and discrete system simulation and numerical results obtained from the simulation are presented and described in section 6. Finally, section 7 concludes the paper and contains scope for future work.

2 Related Works

Numerous works supporting concurrent transmissions have been done to improve the capacity in 2-hop network. Sigh et al. [8] proposed a distributed spatial reuse (DSR) MAC protocol for IEEE 802.11 ad hoc wireless LANs to increase bandwidth utilization and reduce power consumption using power controlled transmission. The power